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points corresponding to the two equinoxes, which correspondence is in the drawing not quite exact. The accuracy of the drawing is, however, amply good enough for the purpose for which it was made.

Cambridge Observatory:
1898 *May* 28.

Revised Catalogue of the Stars of the IV. Type.

By the Rev. T. E. Espin, M.A.

The arrangement of the present catalogue is identical with that of the first catalogue of the Stars of the IV. Type, published in the *Monthly Notices*, vol. xlix. p. 364. The letter H has been used to signify the stars detected at the Harvard Observatory either visually, or by the photo-telescopes at Harvard and Arequipa. Professor Pickering has kindly sent me a complete list of these, containing some that have not hitherto been published. Also some notes on stars in the first catalogue, which, together with my own observations, have caused the removal of several stars from the list, and their being assigned to Type III. One star, No. 191, in the present catalogue, of which Professor Pickering writes, "Omit, not confirmed by the photographs," I have still ventured to retain, as although the star is not above 11·5 mag. I have no doubt as to the correctness of the earlier Harvard observations. I have observed it on several occasions, and although faint the type seemed certain. The stars in Column II. marked Es. and followed by a number, are stars not in the B.D. The other abbreviations in Column VI. are as follows: Se., Secchi; Du., Dunér; D'A., D'Arrest; P., Pechüle; V., Vogel.

The following is a general summary of the catalogue, the first column giving the limiting magnitude, the second the number of stars north of the equator, the third the number of stars south, and the last the totals, the variable stars being entered according to their maximum magnitude:—

Mag.	N.	S.	Total.
to 6·0	3	4	7
6·1 „ 7·0	12	11	23
7·1 „ 8·0	19	20	39
8·1 „ 9·0	51	25	76
Below 9·0	69	11	80
Mag. not given	1	11	12
Total	155	82	237

Excluding variables our knowledge of the number of stars of Type IV. is probably complete for the N. heavens as far as 8·9, and for the southern heavens as far as 8·5. The catalogue contains twenty-eight variables to which letters have been assigned: twenty-two are north and six south. It would appear that almost all the stars of Type IV. are subject to fluctuations in brightness, though the red colour makes it not easy to decide when the variation is small.

No.	B.D. &c.	R.A. (1900).	Decl. (1900).	Mag.	Authority.
		h m	° ′		
1	+49°,41	0 12·3	+49 44	9·0	H.
2	+43°,53	14·6	+44 9	8·2	Se.
3	Es. 832	16·8	+58 36	9·9	Es.
4	+53°,66	19·1	+53 44	9·3	H.
5	+34°,56	22·2	+35 2	8·1	Du.
6	+63°,56	25·5	+63 19	9·3	Es.
7	W Cassiopeiæ	49·0	+58 1	Var.	„
8	+62°,211	1 2·6	+62 27	9·5	„
9	+25°,205	10·6	+25 15	7·0	D'A.
10	R Sculptoris	22·4	−33 3	Var.	H.
11	+59°,274	26·8	+60 8	9·0	Es.
12	Es. 230	27·1	+57 14	9·2	„
13	Es. 1076	37·7	+60 7	9·8	„
14	Es. 1181	37·8	+61 7	9·6	„
15	+53°,379	38·7	+53 28	9·4	H.
16	X Cassiopeiæ	49·8	+58 46	Var.	Es.
17	Es. 1084	2 3·4	+63 9	9·7	„
18	+11°,305	9·6	+11 47	8·9	H.
19	+51°,575	19·8	+51 37	9·0	Es.
20	−10°,513	30·2	− 9 53	8·0	H.
21	+38°,525	32·1	+38 44	9·4	Es.
22	+58°,501	32·3	+59 10	9·5	„
23	V Persei	43·3	+56 34	Var.	H.
24	+57°,647	43·6	+57 26	8·9	Du.
25	+57°,702	3 3·7	+57 31	7·9	H.
26	+47°,783	6·7	+47 27	9·0	Es.
27	+43°,726	20·9	+43 50	8·9	„
28	U Cameli	33·2	+62 19	Var.	Du.
29	+51°,762	34·1	+51 11	8·9	Es.
30	C.Z.C. 3^{h}·1404	46·7	−43 50	8·5	H.
31	Es. 1111	51·3	+60 33	9·2	Es.
32	+61°,667	57·2	+61 31	7·5	„
33	+50°,920	4 3·9	+51 5	9·5	„
34	+50°,961	9·0	+50 22	9·5	„

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No.	B.D. &c.	R.A. (1900).	Decl. (1900).	Mag.	Authority.
		h m	° ′		
35	+48°,1083	4 13·6	+48 56	9·5	Es.
36	T Cameli	30·4	+65 57	Var.	,,
37	Es. 985	32·6	+41 23	9·2	,,
38	+42°,1046	39·6	+42 29	9·5	,,
39	+67°,350	40·8	+68 0	7·0	Se.
40	+34°,911	42·6	+34 49	8·8	Es.
41	C.G.C. 5429	43·8	−36 23	7·6	H.
42	+28°,707	45·2	+28 21	8·1	Se.
43	+38°,955	45·8	+38 20	8·8	Es.
44	+22°,770	47·8	+22 37	9·2	,,
45	R Leporis	55·0	−14 57	Var.	D'A.
46	+50°,1112	55·6	+50 29	8·9	Es.
47	+0°,939	5 0·2	+ 1 2	6·0	Se.
48	+38°,1038	2·5	+38 54	9·5	Es.
49	+45°,1053	2·8	+46 2	9·5	,,
50	−5°,174	4·9	− 5 39	8·7	Du.
51	+35°,1046	12·5	+35 41	8·9	Es.
52	+32°,957	15·3	+32 25	9·3	,,
53	S Aurigæ	20·5	+34 4	Var.	Du.
54	+7°,929	27·8	+ 7 4	8·2	Es.
55	S Cameli	30·2	+68 45	Var.	,,
56	C.G.C. 6519	31·7	−25 48	7·5	H.
57	+24°,898	32·4	+24 57	9·5	Es.
58	+17°,979	35·5	+17 29	8·0	H.
59	+24°,943	39·1	+24 23	8·5	Du.
60	+20°,1083	39·7	+20 39	7·7	,,
61		40·4	−46 30	7½	P.
62	+44°,1288	41·2	+44 48	9·2	Es.
63	+30°,1014	41·7	+30 35	8·5	,,
64	+26°,1117	6 4·7	+26 2	7·4	D'A.
65	+27°,1024	7·3	+27 12	9·0	Se.
66	+29°,1177	13·2	+29 31	9·5	Es.
67	V Aurigæ	16·3	+47 43	Var.	,,
68	+3°,1214	17·1	+ 3 28	9·0	,,
69	+25°,1250	17·8	+25 4	9·5	,,
70	+14°,1283	19·8	+14 47	6·5	Se.
71	Es. 243	20·3	+19 8	Var. ?	Es.
72	+38°,1539	29·7	+38 32	6·3	Se.
73	Es. 1142	33·3	+22 42	9·4	Es.

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No.	B.D. &c.	R.A. (1900).	Decl (1900).	Mag.	Authority.
		h m	° ′		
74	+31°,1388	6 35·7	+31 33	8·1	Es.
75	+3°,1381	39·4	+ 3 25	9·3	H.
76	Es. 63	42·4	+ 0 47	9·6	Es.
77	−6°,1786	47·5	− 7 0	9·1	,,
78	−4°,1708	48·2	− 4 27	9·0	,,
79	C.G.C. 8670	51·3	−42 14	6·7	H.
80	+6°,1462	53·0	+ 6 18	8·0	Es.
81	Es. 1144	55·3	+68 19	10	,,
82	−3°,1685	56·0	− 3 7	7·7	,,
83	−7°,1742	7 2·1	− 7 24	8·3	,,
84	−11°,1805	3·4	−11 46	7·6	Se.
85	+14°,1594	6·6	+14 53	9·0	Es.
86	+25°,1643	14·9	+25 10	9·2	,,
87	−3°,1873	18·1	− 4 2	9·2	H.
88	−3°,1886	19·9	− 4 2	8·7	Es.
89	−2°,2101	20·2	− 2 57	9·0	,,
90	+24°,1686	25·8	+24 43	8·2	,,
91	+2°,1715	31·3	+ 2 18	9·3	,,
92	U Canis Min.	35·9	+ 8 37	Var.	V.
93	+5°,1797	43·4	+ 5 40	9·0	Es.
94	C.G.C. 10488	53·5	−49 43	8	P.
95	−12°,2289	57·5	−12 44	10	H.
96	−38°,4049	8 1·7	−38 29	—	,,
97	−22°,2160	3·1	−22 38	8·6	,,
98	+3°,1958	14·9	+ 3 5	8·3	Es.
99	−17°,2442	15·2	−17 57	9·1	H.
100	C.G.C. 11890	42·4	−29 21	7·9	,,
101	+17°,1973	49·7	+17 37	6·5	D'A.
102	T Cancri	51·0	+20 14	Var.	Es.
103	+14°,2048	9 8·3	+14 37	8·8	H.
104		13·5	−65 49	—	,,
105	−1°,2312	45·9	− 1 33	8·9	,,
106	−22°,2739	46·4	−22 33	6·6	Se.
107		51·3	−41 7	7·5	P.
108	C.G.C. 13699	57·9	−59 49	7¾	,,
109	C.G.C. 13396	10 7·5	−34 50	7¼	,,
110	C.G.C. 14440	30·8	−39 3	5·9	H.
111	U Hydræ	32·6	−12 52	Var.	Se.
112	+68°,617	38·1	+67 56	6·2	Du.

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No.	B.D. &c.	R.A. (1900). h m	Decl. (1900). ° ′	Mag.	Authority.
113		10 42·5	−65 5	—	H.
114	V Hydræ	46·8	−20 43	Var.	Se.
115	+69°,644	56·5	+69 47	8·9	H.
116	C.Z.C. 11$^{\mathrm{h}}$·129	11 2·9	−54 35	9	"
117	C.Z.C. 11$^{\mathrm{h}}$·742	11·2	−57 23	9	"
118	−13°,3407	30·7	−14 2	8·5	"
119	C.G.C. 15946	35·0	−72 0	8·5	"
120		55·3	−54 33	—	"
121		12 9·4	−50 58	—	"
122		19·3	−48 51	—	"
123	+1°,2694	20·1	+ 1 19	8·1	Se.
124	−37°,7905	24·0	−37 42	8·8	H.
125	+46°,1817	40·4	+45 59	5·5	Se.
126	+66°,780	52·5	+66 32	7·3	"
127	+38°,2389	54·7	+38 21	8·6	H.
128	C.Z.C. 13$^{\mathrm{h}}$ 717	13 13·4	−73 55	8½	"
129	C.G.C. 18157	15·5	−63 42	8	"
130	C.Z.C. 13$^{\mathrm{h}}$·1490	26·4	−53 19	9·6	"
131	C.G.C. 18947	51·6	−55 51	8	"
132	C.G.C. 19254	14 7·4	−53 28	7·5	"
133	C.G.C. 19416	15·7	−49 24	8½	"
134	C.G.C. 19745	29·5	−42 56	8·5	"
135		52·2	−53 0	—	"
136	C.G.C. 20554	15 4·8	−69 42	6·2	"
137	C.G.C. 20937	21·9	−24 49	7·6	"
138	V Coronæ	45·9	+39 52	Var.	Du.
139	RR Herculis	16 1·5	+50 46	Var.	Es.
140		21·1	−43 26	—	H.
141	V Ophiuchi	21·2	−12 12	Var.	Du.
142		39·8	−67 36	—	H.
143	C.G.C. 23005	54·3	−54 55	8½	"
144		17 11·6	−45 52	—	"
145	−19°,4644	23·9	−19 23	7·8	Du.
146	C.G.C. 23935	34·7	−57 40	7·0	H.
147	−18°,4634	39·1	−18 37	8·5	Du.
148	C.Z.C. 17$^{\mathrm{h}}$·2657	40·8	−35 40	8·0	H.
149	T Draconis	54·9	+58 14	Var.	Es.
150	−39°,12196	58·2	−39 20	9·0	H.
151	+9°,3576	18 4·0	+ 9 26	9·4	"

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No.	B.D. &c.	R.A. (1900). h m	Decl. (1900). °	Mag.	Authority.
152	−19°,4907	18 7·8	−19 16	9·5	Es.
153	Holden 150	7·9	−19 7	—	„
154	−13°,4918	12·7	−13 29	9·2	„
155	−15°,4923	13·6	−15 39	9·0	H.
156	−38°,12843	23·4	−38 29	9·5	„
157	+4°,3779	26·4	+ 4 19	9·3	Es.
158	T Lyræ	28·9	+36 55	Var.	Se.
159	−7°,4633	31·6	− 7 41	9·0	Es.
160	+32°,3160	33·6	+33 1	9·3	„
161	C.Z.C. 18ʰ·1935	35·2	−51 51	9	H.
162	+36°,3243	39·4	+36 52	7·5	Se.
163	−8°,4726	44·9	− 8 1	7·1	Du.
164	+0°,4046	52·4	+ 0 19	9·2	Es.
165	+14°,3729	54·0	+14 14	9·0	Du.
166	+10°,3764	57·5	+10 6	9·5	Es.
167	V Aquilæ	59·1	− 5 50	Var.	V.
168	C.G.C. 26129	59·7	−38 17	8·3	H.
169	−16°,5272	19 13·4	−16 6	6·8	„
170	+10°,3857	13·8	+10 20	9·5	Es.
171	U Lyræ	16·6	+37 41	Var.	„
172	+76°,734	25·1	+76 22	6·5	Se.
173	+45°,2906	25·8	+45·50	8·6	Es.
174	−16°,5360	28·6	−16 35	7·2	Se.
175	+32°,3522	37·1	+32 23	8·0	Du.
176	−18°,5480	40·6	−18 24	9·1	H.
177	Es. 1021	42·9	+15 48	9·5	Es.
178	+85°,332	43·8	+85 9	9·2	H.
179	+24°,3902	46·3	+24 41	9·2	Es.
180	Es. 415	46·7	+14 45	9·8	„
181	+43°,3425	54·0	+43 59	8·2	Du.
182	−7°,5141	55·7	− 7 39	9·8	H.
183	+9°,4369	56·3	+ 9 14	8·7	„
184	Es. 181	57·1	+30 33	9·5	Es.
185	+20°,4390	58·9	+20 48	9·4	„
186	+40°,4001	20 0·9	+40 9	9·5	„
187		5·1	+35 31	—	H.
188	+41°,3632	6·3	+41 12	Var.	Es.
189	+47°,3031	6·4	+47 33	Var.	Du.
190	RY Cygni	6·6	+35 38	Var.	H.

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No.	B.D. &c.	R.A. (1900).		Decl. (1900).		Mag.	Authority.
		h	m	°	′		
191	Pickering No. 38	20	7·3	+35	48	(11)	H.
192	RS Cygni		9·8	+38	28	Var.	Du.
193	−21°,5672		11·2	−21	37	Var.	Se.
194	Es. 1170		11·8	+36	47	11	Es.
195	Es. 900		12·4	+37	34	10	„
196	Es. 417		13·2	+49	38	Var.	„
197	Es. 902		13·3	+36	36	11·5	„
198	+37°,3876		14·8	+37	5	9·5	„
199	U Cygni		16·5	+47	34	Var.	Se.
200	+35°,4077		17·4	+35	18	9·5	Es.
201	+37°,3903		17·9	+37	13	9·4	„
202	RW Cygni		25·2	+39	39	Var.	„
203	−12°,5755		26·2	−12	13	9·2	H.
204	+40°,4210		27·4	+40	11	9·4	Es.
205	+68°,1140		36·1	+68	12	8·8	„
206	V Cygni		38·1	+47	47	Var.	V.
207	+45°,3271		43·5	+45	41	Var.	Es.
208	+32°,3954		45·2	+32	51	9·4	„
209	Es. 1172	21	6·5	+32	57	9·1	„
210	C.G.C. 29232		13·6	−45	27	6·0	H.
211	Es. 923		14·4	+51	49	9·5	Es.
212	C.G.C. 29252		15·2	−70	10	6·8	H.
213	+41°,4114		18·6	+41	58	9·5	Du.
214	+61°,2134		23·3	+62	8	8·8	Es.
215	+49°,3535		25·8	+49	53	9·4	„
216	+47°,3429		26·1	+48	7	9·5	„
217	S Cephei		36·5	+78	10	Var.	Du.
218			36·6	−65	30	—	H.
219	+34°,4500		37·8	+35	3	6·2	D'A.
220	RV Cygni		39·1	+37	34	Var.	Se.
221	+53°,2693		40·7	+53	15	9·2	Es.
222	Es. 931		43·0	+52	5	9·5	„
223	+52°,3036		43·6	+52	13	9·3	„
224	+49°,3673		51·5	+50	1	9·1	Du.
225	C.G.C. 30526	22	16·6	−46	27	6·7	H.
226	Es. 1046		24·8	+64	23	10	Es.
227	+60°,2432		40·4	+61	12	8·9	„
228	+54°,2863		43·6	+54	38	9·5	„
229	+45°,4121		57·2	+45	21	9·5	„

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No.	B.D. &c.	R.A. (1900). h m	Decl. (1900). ° ′	Mag.	Authority.
230	Es. 1048	23 6·0	+60 43	9·0	Es.
231	−21°,6376	6·3	−21 32	9	H.
232	+48°,4051	22·2	+48 58	9·3	Es.
233	+2°,4709	41·3	+2 56	6·2	Se.
234	+5°,5223	44·0	+5 50	8·7	H.
235	+60°,2634	48·0	+60 27	9·0	Es.
236	+59°,2810	56·2	+59 48	7·8	Du.
237	+42°,4827	59·5	+43 0	8·4	Es.

Further Researches on the Orbit of γ Lupi = h 4786.

By T. J. J. See, A.M., Ph.D. (Berlin).

In the *Monthly Notices* for 1897 November I have indicated the general nature of the orbit of γ *Lupi*. At the time that paper was prepared, it did not seem probable that a material improvement of the result announced could be expected for some twenty years; but a few observations made by Captain Jacob at a particularly opportune epoch, near the middle of the century and unknown to me at the time of my first investigation, have made possible a revision which defines the motion of this remarkable star with singular precision. We are thus enabled to determine a set of elements which are very satisfactory. Considering the small number of observations available, it must be conceded that this result is one of the happiest yet afforded by the history of double star astronomy. The excellence of the orbit derived from only a few observations is due to their advantageous distribution, which gives each measure a particularly decisive import. The singular and almost unique character of the orbit also renders its determination comparatively easy. We find that the system of γ *Lupi* is situated like that of 42 *Comæ Berenices*, and that all the motion takes place in a right line at position angles 93°·5—273°·5. An investigation of the areas described shows that the major axis of this system does not depart sensibly from the line of sight; and hence the determination of the elements is somewhat easier than in the case of 42 *Comæ Berenices*, where λ differs sensibily from 90°.

As nearly all the observations of γ *Lupi* were given in my former paper, I content myself here with adding those since unexpectedly discovered, and a few which Mr. Boothroyd and I have recently taken at Flagstaff.